May 29, 1928. 1,671,954

H. J. KASCH

RHEOSTAT

Filed Nov. 20, 1925

Fig. 1

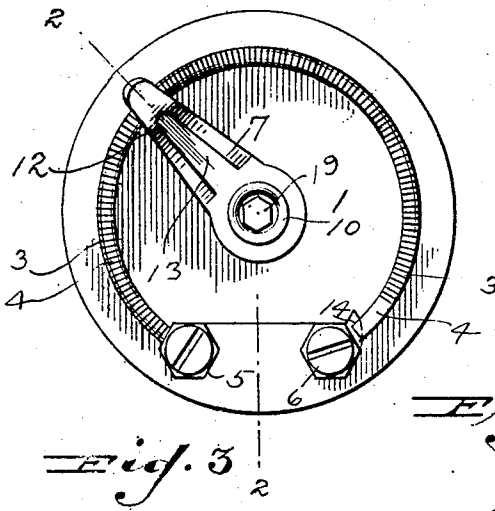


Fig. 2

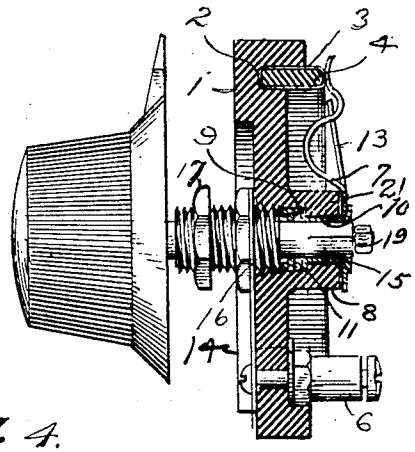
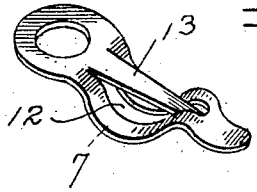


Fig. 3

Fig. 4.

Fig. 5



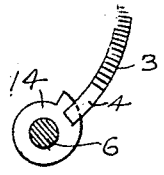


Fig. 7.

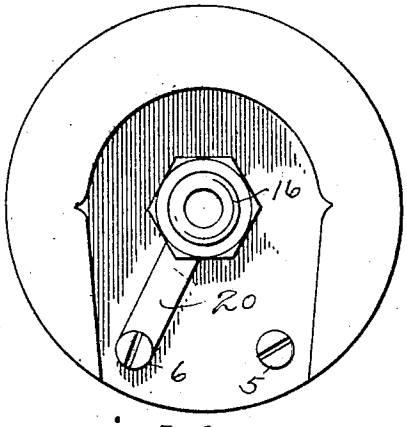
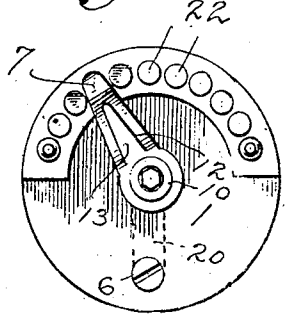


Fig. 6.



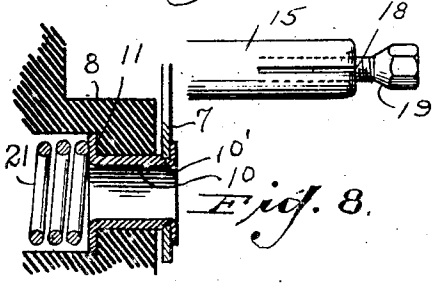


Fig. 8.

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Patented May 29, 1928. 1,671,954

UNITED STATES PATENT OFFICE.

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RHEOSTAT.

Application filed November 20, 1925. Serial No. 70,309.

My invention relates to variable electrical devices and more particularly to rheostats, switches and the like, employing oscillating contact arms.

While the novel features of the present invention are applicable to other purposes and instruments, the construction has been designed primarily as a rheostat and contemplates the employment of a thin, flexible contact arm, which in order to insure a uniform, light pressure, has been made of considerable length and its operative reach shortened by bending it to a bowed or curvilinear form, the contact arm being reinforced to resist side strain in its to and fro oscillatory movement by a shorter and stiffer driving finger which has operative engagement with the contact arm adjacent to its free extremity. In lieu of relying upon a mere trunnion bearing of the contact arm shaft, there is employed in the present instance a yielding spring contact intermediate the stationary shaft bushing, and the head of the contact arm, which supplements the current carrying capacity of the shaft or stem, and furthermore compensates for inequalities of manufacture facilitating the assembly and enabling the device to be constructed economically. As a further means of facilitating manufacture and assembly and compensating for variation of size of parts, there is employed for anchoring the rheostat element, an eccentric washer, the edge of which is embedded in the rheostat element to secure it in position, the eccentricity of the locking washer compensating for slight irregularities in the size or location of the rheostat element. The several parts are assembled upon the base or mounting wholly independent of the actuating shaft or stem, which may be withdrawn and inserted without changing the relation or necessitating the removal of other parts. The extremity of the shaft or stem is expanded into firm gripping engagement with the oscillatory contact arm by a tapered adjusting screw engageable in the split end of the shaft.

The object of the invention is to simplify the structure, as well as the means and mode of operation of such electrical devices, whereby they will not only be cheapened in construction, but will be more efficient in use, positive in operation, uniform in action and unlikely to get out of repair.

A further object of the invention is to provide an improved form of contact arm, possessing a maximum degree of flexibility and adapted to lightly but uniformly engage the contact element and to provide a reinforcing or driving finger, which will carry such contact arm to and fro without subjecting it to twisting strains or distortion.

A further object of the invention is to provide an improved method of assembly, whereby the contact arm may be mounted upon the base or mounting, independent of the actuating stem or shaft, and to provide auxiliary current conducting means for electrically connecting the contact arm with a stationary terminal, independent of the shaft or stem and supplemental thereto,

A further object of the invention is to provide compensating means for inequalities of manufacture and adjustment of the parts, by providing a helical spring about the shaft or stem, and interposed between the stationary bushing or bearing sleeve or such shaft and the head of the contact arm.

A further object of the invention is to provide improved means for anchoring the resistance element of a rheostat or the like, and for compensating for irregularities of size and position of such element.

A further object of the invention is to provide improved means for detachably interconnecting the removable shaft or stem with the contact arm.

With the above primary and other incidental objects in view as will more fully appear in the specification, the invention consists of the features of construction, the parts and combinations thereof, and the mode of operation or their equivalents as hereinafter described and set forth in the claims.

In the accompanying drawings, wherein is shown the preferred, but obviously not necessarily the only form of embodiment of the invention, Fig. 1 is a rear elevation of an assembled rheostat embodying the present invention. Fig. 2 is a sectional view thereof on line 2—2 of Fig. 1. Fig. 3 is view of the front face of the rheostat, with the adjusting knob removed. Fig. 4 is a detail perspective view of the reenforced contact arm. Fig. 5 is a detail view of the compensating eccentric anchor ring washer, Fig. 6 is a detail view of the shaft expanding means. Fig. 7 illustrates the invention applied to a

multipoint switch. Fig. 8 is an enlarged detail view of the contact arm connection.

Like parts are indicated by similar characters of reference throughout the several views.

Referring to the drawings, 1 is the base or mount of circular form and preferably molded from phenolic condensation materials, or of other material possessing electro insulating characteristics. The base 1 is formed with a concentric groove or slot 2, in which is located the resistance element comprising a winding 3 of resistance wire, about a curvilinear core 4 of suitable non-conductive material. The winding 3 of the resistance element is connected at one end to a binding post or terminal 5. Connection is made between various points throughout the extent of the resistance element, and a second terminal or binding post 6, by means of an oscillatory contact arm 7. The base or mounting 1 is formed with a central hub or boss 8, which is counter-bored rather deeply at 9, from the face or forward side of the base or mounting 1. Inserted without the counter-bored orifice of the boss or hub 8 is a flanged bushing 10, the flange 11 of which seats upon the shoulder within such bore, while the opposite end of the bushing or sleeve 10 is shouldered at 10′ and projects through an opening in the head in the contact arm 7, and is permanently secured thereto by being expanded by a spinning process or by swedging. Obviously, the bushing 10 and head of the contact arm 7 may be connected by other suitable means as by soldering, brazing, welding or otherwise, if so desired. By this means the contact arm 7 is provided with a permanent trunnion bearing within the hub or boss 8 of the base or mount 1. As is generally recognized the resiliency of a spring arm increases somewhat with its length. In the present instance to afford the arm 7 a maximum degree of flexibility, and resiliency without unduly increasing the radius of the resistance element, the arm 7 has been shown formed with reverse bends, into a substantially **S**-shape, which affords a maximum degree of flexibility, allowing the contact arm to bear evenly but lightly upon the resistance element. A spring arm having such maximum degree of flexibility in relation to its operative radius is quite likely to have a tendency to twist or distort under the influence of lateral resistance as the arm is moved to and fro over the resistance element. This twisting or distortion is especially likely in the event that the arm is brought forcibly into contact with one of the binding posts 5 or 6, at the limit of its range of movement. In order to actuate the contact arm uniformly to and fro through its oscillatory movement without interfering with its resiliency or changing its contact pressure upon the resistance unit, the arm 7 is slotted longitudinally at 12, and the head of such arm is formed with an integral finger 13, which is of much less length than the contact arm, and hence more stiff or rigid, which finger 13 projecting across the bight or bend of the contact arm 7 in the relation of a chord thereto projects within the slot 12 of the contact arm adjacent to the free or contact end thereof. The engagement of this finger 13 with the free end of the contact arm affords a positive driving connection between the head and the free end of the arm, by which the arm may be moved to and fro without warping or distortion, yet it does not interfere with the resiliency or flexibility of the contact arm 7.

It sometimes happens in the assembly of the rheostat that the core 4 of the resistance element does not terminate in the same relation with the binding post 6 in each of a number of instruments. This is sometimes due to a slight displacement of the unit in the slot 2, or to slight irregularities or inaccuracy in the length of the core 4 of the unit or element. To overcome this lack of uniformity and to anchor the resistance element core, the attachment studs of the binding post 6 is provided with a lock washer 14 of an eccentric or involute cam shape. The marginal edge of this washer is quite thin. By rotating the lock washer 14 upon the stud of the binding post the eccentric edge of the washer is embedded in the core 4 of the resistance element as shown in Fig. 5, thereby anchoring the element securely in place, after which the attachment stud of the binding post is tightened to hold the anchor washer in its adjusted position.

The contact arm 7 is oscillated to and fro by means of an actuating shaft or stem 15, journalled in a bushing sleeve 16. One end of this bushing sleeve 16 is screw threaded into the counter bore of the base or mount 1. The exterior of the bushing sleeve 16 is threaded to receive a collar or nut 17, by which the rheostat may be secured to a panel or other support, thus affording a single hole mounting feature. The shaft 15 may be secured to the contact arm 7 by any suitable coupling means. However, for convenience of assembly the shaft 15 is preferably slotted at its inner end and is bored and threaded to receive a screw stud 18, having a somewhat conical head 19. The engagement of the conical face 19 of the screw stud head within the bore in the end of the shaft 15 serves to expand the end of the shaft within the bushing 10. This construction affords a secure locked engagement between the actuating shaft or stem 15 and the contact arm. Ordinarily, the trunnion bearing of the stem or shaft 15 within a bushing sleeve is sufficient to carry electric current from the contact arm through such

shaft or stem and then through the bushing sleeve 16, which is connected by a bridging connection 20 with the stud of the binding post 6. However to insure perfect electrical connection between the contact arm and the binding post terminal and to supplement the current carrying capacity of the trunnion engagement of the shaft 15, within its bearing sleeve 16, there is interposed between the inner end of the bearing sleeve 16, and the flanged head 11 of the contact arm bushing 10, a helical spring 21, comprising a few turns of electro-conductive material. This spring 21 exerting its expansive force in opposite direction bears at one end against the head of the bushing 10, which is directly connected with the contact arm 7, and at its opposite end it bears against the ends of the bushing sleeve 16, which is directly connected by the bridging contact 20, with the binding post 6. This spring 21 has the further function of compensating for any irregularities or inaccuracies of manufacture, and eleminates looseness or clatter.

While the construction is especially designed and has been described as a rheostat, the same construction may be employed for a switch by substituting for the resistance element 3—4 a series of contact points 22, as shown in Fig. 7. For such purposes, the same form of mounting may be employed, with the identical switch arm construction and shaft or stem mounting, with a connection to the binding post terminal 6. In such case, the binding post 5 may be omitted.

From the above description it will be apparent that there is thus provided a device of the character described possessing the particular features of advantage before enumerated as desirable, but which obviously is susceptible of modification in its form, proportions, detail construction and arrangement of parts without departing from the principle involved or sacrificing any of its advantages.

While in order to comply with the statute the invention has been described in language more or less specific as to structural features, it is to be understood that the invention is not limited to the specific details shown, but that the means and construction herein disclosed comprises the preferred form of several modes of putting the invention into effect and the invention is, therefore, claimed in any of its forms or modifications within the legitimate and valid scope of the appended claims.

Having thus described my invention, I claim:

1. In an adjustable current control device of the character described, a mounting, a contact element, a movable flexible spring contact arm for engaging said element, said arm being of arcuate formation in a direction perpendicular to its plane of movement, and a driving finger movable with the contact arm, extending as a chord across the arc formed by the contact arm substantially in the plane of movement into engagement with the contact arm adjacent to its free end and means for actuating the driving finger.

2. In an adjustable current control device of the character described, a mounting, a contact element, a movable contact arm carried by the mounting for engagement with said element, said arm being of arcuate formation in the plane of its contact pressure, and an aligning finger extending across the bight of said arm and having engagement with the free end thereof to prevent lateral distortion of the arm while permitting free movement thereof in the pressure plane.

3. In an adjustable current control device, a mounting, a contact element, an oscillatory flexible contact arm, exerting yielding pressure upon said element, and a less flexible actuating finger extending substantially from the axis of oscillation into engagement with the free end of the flexible contact arm.

4. In an adjustable current control device of the character described, a mounting, a contact element to be engaged, a pair of interengaged radially disposed oscillatory arms movable to and fro in unison, one of which engages said element under yielding pressure, while the other arm reinforces the first arm against lateral deflection.

5. In an adjustable current control device of the charcter described, a mounting, a contact element to be engaged, two oscillatory arms interengaged for unison movement to and fro in their plane of oscillation, one of said arms engaging said contact element being loosely coupled to the other arm adjacent to its point of engagement and capable of yielding tension movement perpendicular to its plane of oscillation independent of the other, the latter arm serving to reinforce the first arm against lateral deflection in its plane of oscillation.

6. In an adjustable current control device of the character described, a mounting, a contact element to be engaged, a flexible contact arm and a comparatively inflexible actuating arm operatively engaged at their free ends for unison to and fro movement, said contact arm being capable of independently flexing movement perpendicular to the plane of oscillation relative to the driving arm.

7. As an article of manufacture, a contact element for electrical apparatus, and the like, comprising an arm longitudinally slotted to form an integral tongue of less length than the arm, said slotted arm being bent into arcuate form with the extremity of the short arm projecting through an opening adjacent the extremity of the longer arm.

8. As an article of manufacture a contact

means for electrical apparatus and the like, comprising a pair of arms of different length, mounted for movement in unison, the longer arm being bent into arcuate form with the extremity of the shorter arm projecting through an opening adjacent to the extremity of the longer arm.

9. As an article of manufacture, a contact means for electrical apparatus, and the like, comprising a pair of arms mounted for unison movement, one of said arms being bent to arcuate form the other arm extending across the bight of the arcuate arm and having driving engagement therewith adjacent to its free end.

10. As an article of manufacture a contact means for electrical apparatus and the like, comprising a pair of arms, one of the arms being of arcuate form and the other arm extending across the bight of the arcuate arm and having yielding connection therewith adjacent to its free end by which the arms are capable of relative independent movement in one plane but are engaged for unison movement in a different plane.

11. As an article of manufacture, a contact arm for electrical apparatus comprising a length of material longitudinally slotted to form an integral tongue, of less length than the arm, said arm being bent to arcuate form with the end of the integral tongue engaged with the arm beyond the bight of its arcuate form.

12. In a device of the character described, a mounting, having therein a counterbored hole, an oscillatory contact arm, a trunnion bearing for said arm comprising a flanged bushing journalled within said counterbored hole with the flange of said bushing seated upon the shoulder formed by the counterbore and the other end of the bushing projecting beyond the mounting into engagement with the contact arm, an actuating stem projecting within said bushing and an electro conductor engaging the end of the bushing remote from said contact arm for electrically connecting the arm with the opposite side of the mounting independent of the shaft.

13. In a device of the character described, a mounting having therein a counterbored hole, a bushing sleeve within said hole having an external shoulder engaging the shoulder formed by the counterbore, said sleeve projecting thence through the reduced portion of the counterbore, an oscillatory contact arm connected with the bushing sleeve and an actuating stem therefor and an electrical connection in the side of such mounting opposite the contact arm electrically connected with said arm through said bushing sleeve independent of the actuating stem.

14. In a device of the character described, a mounting having a hole therein, an oscillatory contact arm, a trunnion member therefor engaging in said hole in the mounting, a bushing also engaged in said hole from the opposite side of the mounting and terminating in spaced relation with the trunnion bearing, a helical spring interposed between the bushing and trunnion member within said hole and serving to electrically connect said parts one with the other, and an adjusting shaft extending through said bushing into engagement with the contact arm.

15. In a device of the character described, a mounting having a hole therein, a contact arm journaled in said hole, a bushing extending within said hole from the opposite side of the mounting, a spring interposed between the bushing and contact arm journal mounting, and exerting pressure tending to separate said parts, and means for oscillating the contact arm.

16. In a device of the character described, a mounting, a rotary shaft mounted therein, a contact arm movable with the shaft, a sleeve in said mounting in spaced relation with the contact arm and forming a bearing for said shaft, and means for conducting electric current from the contact arm to the sleeve independent of said shaft.

17. In a device of the character described, a mounting, a rotary shaft mounted therein, a contact arm movable with the shaft, a sleeve in said mounting in spaced relation with said contact arm and forming a bearing for said shaft, and a helical spring surrounding the shaft intermediate the sleeve and the contact arm and electrically connecting said elements one to the other independent of said shaft.

18. In a construction of the character described, the combination with a mounting, an oscillatory contact arm, a bushing revolubly secured in the mounting, upon which said oscillatory contact arm is carried, a bearing sleeve stationarily secured in said mounting in axial alignment with said revoluble bushing, an actuating shaft revolubly mounted in said bearing sleeve and fixedly secured in said bushing and a helical spring surrounding said shaft intermediate the bearing sleeve and bushing and abutting thereon at its opposite ends.

19. In a construction of the character described, the combination with a mounting, an oscillatory contact arm, an actuating shaft therefor, and a mounting, an element carried by said mounting for engagement of the contact arm, and a revolubly mounted eccentric washer, engageable with said element by its revoluble adjustment to anchor said element to said mounting.

20. An electrical apparatus of the character described, including a mounting, an oscillatory contact arm and an element engaged thereby, characterized by an eccentric washer pivoted upon said mounting in prox-

imate relation to said element, the eccentric edge of which is projected into said element to anchor the element by the rotary adjustment of the washer.

21. In a construction of the character described, the combination with a support and a member to be anchored thereto of an eccentric washer pivoted to the support in proximate relation to said member to be anchored, the eccentric edge of which is embedded in the member by rotary adjustment of the washer to secure such member to the support.

22. In a construction of the character described, the combination with a mounting and an oscillatory contact arm, of a pivotal interconnection between said parts including a tubular bushing member, a peripheral flange at one end of said bushing member having engagement with the mounting and a peripheral shoulder adjacent the opposite end of the tubular bushing, with which the arm engages, the tubular bushing and arm being fixedly united, a spring tending to press the bushing longitudinally in the direction of said arm, whereby the arm will be maintained beyond and out of contact with other parts of the structure to minimize friction, said bushing having rotary engagement in the mounting.

In testimony whereof, I have hereunto set my hand this 3rd day of November, A. D. 1925.

HENRY J. KASCH.